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REMARKS

Applicant appreciates the consideration shown by the Office, as evidenced by the Final Office Action, mailed on December 5, 2002, and the February 14, 2003, telephone interview with Examiner Parviz Hassanzadeh. In that Office Action, Claims 1-31 were rejected by the Examiner. Claims 32-44 have been withdrawn from consideration. As such, Claims 1-44 remain in the case with none of the claims being allowed.

The December 5 Final Office Action and February 14 telephone interview been carefully considered. After such consideration, Claims 1, 10, and 18 have been amended. Applicant respectfully requests reconsideration of the application by the Examiner in light of the above amendments and the following remarks offered in response to the December 5 Final Office Action.

Drawings

The approval by the Examiner of the proposed amendment to the drawings is hereby acknowledged. The Examiner has required a proper drawing correction in response to the December 5 Office Action. A corrected Figure 1 is submitted herewith.

Rejections under 35 U.S.C. §103(a)

Claims 1-16, 18-23, and 25-31 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hwang (U.S. Patent 6,383,953 B2) in view of Knowles et al. (U.S. Patent 5,560,779). The Examiner states that it would have been obvious to "implement the spray bars 102 of Knowles et al. in the apparatus of Hwang in order to improve mixing of the hydrocarbon gas with the plasma stream."

Applicant submits that, in order to establish a *prima facie* case of obviousness, the references must teach or suggest all of the claim limitations of the present invention.

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Applicant submits that Claims 1, 10, and 18 have each been amended to clarify the relationship between the common reactant gas injector 220 and the array of plasma sources 210. Applicant submits that, as shown in Figures 2 and 3, a common reactant gas injector 220 provides reactant gas to the plasmas generated by plasma sources 212 as the plasmas enter the deposition chamber 204 through openings 206. As can be seen in Figures 2 and 3, the common reactant gas injector 220 is located in the deposition chamber 204 and is circumferentially disposed with respect to the plasmas entering deposition chamber 204 and does not obstruct or impede the direct flow of plasmas exiting through openings 206 to substrate 230. Accordingly, Claims 1, 10, and 18 have each been amended to recite the limitation of a common reactant gas injector 220 that provides reactant gases to the array of plasmas, wherein the common reactant gas injector is circumferentially disposed with respect to the plurality of plasmas generated by the array of plasma sources.

In addition, Applicant submits that Claims 1 and 18 have each been amended to clarify the relationship among individual plasma sources 212 in array 210 by reciting the limitation that the array of plasma sources 210 comprises a plurality of individual plasma sources that are separate from each other. See, for example, Figures 2 and 3.

Applicant also submits that Claims 1 and 18 have been amended to point out that substrate 230 is movable. Support for this amendment is found in paragraph [0040], found on page 13 of the specification.

Applicant submits that the combination of Hwang or Knowles et al. neither teaches nor suggests a common reactant gas injector that is *circumferentially* disposed with respect to the plurality of plasmas generated by the array of plasma sources. Hwang instead teaches a disk type supply plate 312 in which a plurality of nozzles 314, which supply a reactive gas, are interspersed *between* plasma torches 212. Applicant submits that, by teaching the placement of nozzles between the plasma torches 212 rather than circumferentially locating the reactant gas injector, Hwang actually teaches *away* from the

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present invention. Applicant further submits that Knowles et al. as well do not teach or suggest the above-referenced limitation recited in the amended claims. As noted by the Examiner on page 8 of the December 5 Office Action, "Knowles fails to explicitly teach the injection grid 100 being coupled to a common gas source." Applicant also submits that, rather than teach a common reactant gas injector that is *circumferentially* disposed with respect to the plurality of plasmas, the reference, in Figure 8 and column 5, lines 48-50, teaches an injector grid 100 comprising a plurality of spray bars 102 "*interposed* into the diverging plasma stream (emphasis added)." Applicant submits that Knowles et al., by teaching a reactant gas injector comprising a plurality of spray bars that are interposed, rather than circumferentially located, into the plasma stream, in fact teach *away* from the present invention.

Because the combination of references cited by the Examiner fails to teach all of the limitations of amended independent Claims 1, 10, and 18, applicant submits that the rejection of these claims and the claims dependent thereon under 35 U.S.C. §103(a) as being unpatentable over Hwang in view of Knowles et al. is successfully overcome.

Claims 1-16, 18-23, and 25-31 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Knowles et al. in further view of Matsuada et al. (U.S. Patent 6,189,485 B1). The Examiner states that it would have been obvious to implement the common gas inlet/outlet manifolds as taught by Matsuada et al. in the apparatus of Knowles et al.

Applicant submits that, in order to establish a *prima facie* case of obviousness, the references must teach or suggest all of the claim limitations of the present invention. Accordingly, Applicant submits that Knowles et al. does not teach or suggest an array comprising a plurality of *individual* plasma sources in which the plasma sources are *separate* from each other; i.e., each individual plasma source has a cathode and an anode. As noted by the Examiner, the reference instead teaches a *single* plasma generator 80 having a single anode plate 82 and corresponding cathodes 88, as shown in Figure 7 and

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described in column 5, lines 19-41, of the reference. Applicant submits that Matsuada et al. fail to teach this limitation as well.

Applicant further submits that, as previously presented, Knowles et al. does not teach a common reactant gas injector that is *circumferentially* disposed with respect to the plurality of plasmas. Instead, the reference, in Figure 8 and column 5, lines 48-50, teaches an injector grid 100 comprising a plurality of spray bars 102 "*interposed* into the diverging plasma stream." Applicant submits that Matsuada et al. also fail to teach the limitation of a common reactant gas injector that is *circumferentially* disposed with respect to the plurality of plasmas.

Applicant therefore submits that, because the combination of references neither teaches nor suggests all of the limitations of the present invention, the rejection of Claims 1-16, 18-23, and 25-31 under 35 U.S.C. §103(a) as being unpatentable over Knowles et al. in view of Matsuada et al. is successfully overcome.

Claims 17 and 24 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hwang in view of Knowles et al., and in further view of Maeda et al. (U.S. Patent 5,620,523). The Examiner states that "it would have been obvious to implement the ring-shaped reaction gas discharge design as taught by Maeda et al. in the apparatus taught by Hwang in order to prevent forming deposit on the reactant gas injector which would peel off and fall on the substrate."

Applicant respectfully submits that in order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation to modify the references or to combine reference teachings. The requisite suggestion or motivation must come from the references themselves, rather than from the Applicants' specification. Obviousness cannot be established by locating references that describe various aspects of the invention without also providing evidence of the motivating force that would impel one skilled in the art to do what the Applicant has done.

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Accordingly, Applicant submits that there is no motivation or suggestion to combine the references. Neither Hwang nor Knowles et al. mention formation of a deposit on the reactant gas injector and thus provide no suggestion or motivation to provide either of these references with the ring of Maeda et al. Applicant submits that it is unlikely that any deposit will be formed on reactant gas injector (i.e., disk type supply plate 312 in Figure 5 of the reference) by reaction between the reactant gas and the plasma. The disk supply plate 312 of Hwang is located above the plasma source; there is no plasma present in the vicinity of disk supply plate 312 with which the reactant gas may react. Moreover, as the plasma flames (218 in Figure 4 of the reference) are directed away from disk type supply plate 312 and toward substrate 306. The high velocity of plasma flames 218 would tend to sweep any reactant gas and products of the reaction with the plasma flames away from disk type supply plate 312 and toward the substrate, rather than deposit on the disk supply plate. X

Applicant submits that the formation of deposits on the injector bars of Knowles et al. is also unlikely. The reference teaches the use of high temperature (3000°C), high velocity plasma jets. The arc plasma generated by the reference exits the plasma source at supersonic speed. See column 3, lines 30-32, and column 4, lines 21-23. Reactant gas is injected through an injector grid 100, comprising a plurality of spray bars 102, that is interposed into the plasma stream. Applicant submits that any products formed by reaction between the plasma stream and reactant gas would not deposit on the injector bars, but would instead be swept by the high velocity plasma 36 towards the substrate to form a diamond film 12.

Applicant submits that Maeda et al., in contrast to Knowles et al. and Hwang, do not teach a plasma source that produces a high velocity plasma plume or flame. The plasma gas of Maeda et al. has a longer residence time in the vicinity of the injector ring, and is therefore more likely than either of Knowles et al. and Hwang to form a deposit on the injector ring.

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Applicant therefore submits that, because there is no suggestion or motivation to modify the references as suggested by the Examiner, the rejection of Claims 17 and 24 under 35 U.S.C. §103(a) as being unpatentable over Hwang in view of Knowles et al., and in further view of Maeda et al. is successfully overcome.

In light of the amendment and remarks presented herein, Applicant submits that the case is in condition for immediate allowance and respectfully requests such action. If, however, any issues remain unresolved, the Examiner is invited to telephone the Applicant's counsel at the number provided below.

Respectfully submitted,



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